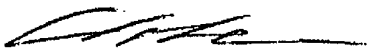
I, Charles Edward SITCH BA,

translator to RWS Group Ltd, of Europa House, Marsham Way, Gerrards Cross, Buckinghamshire, England, hereby declare that I am conversant with the English and French languages and am a competent translator thereof. I declare further that to the best of my knowledge and belief the following is a true and correct translation of the accompanying French Patent Application No. 04/00,664 filed on 23 January 2004.

Signed this 23rd day of March 2010



C. E. SITCH

For and on behalf of RWS Group Ltd

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1 NAME AND ADDRESS OF THE APPLICANT OR THE REPRESENTATIVE TO WHOM THE CORRESPONDENCE IS TO BE ADDRESSED

BLOCH & ASSOCIES
Conseils en Propriété Industrielle
2 Square de l'avenue du bois
75116 PARIS

Your file references: *(optional)*

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3 TITLE OF THE INVENTION **(200 characters or spaces maximum)**

Indirect shooting apparatus for fixing fastening elements in a base material

4 PRIORITY DECLARATION OR APPLICATION FOR THE BENEFIT OF THE FILING DATE OF A PRIOR FRENCH APPLICATION

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5 APPLICANT **(Tick one of the 2 boxes)** ☒ **Legal entity** ☐ **Natural person**

Name or company name		Société de Prospection et d'Inventions Techniques SPIT
Forenames		
Legal form		Société Anonyme
SIREN No.		437181076
APE-NAF Code		
Domicile or registered office	Street	150 Route de Lyon
	Postcode and town	26501 BOUR LES VALENCE
	Country	FRANCE
Nationality		French
Telephone No. *(optional)*		Fax No. *(optional)*
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Name		BLOCH & ASSOCIES
Forename		
Firm or Company		Conseils en Propriété Industrielle
No. of permanent power of attorney and/or contractual arrangement		
Address	Street	2 Square de l'avenue du bois
	Postcode and town	75116 PARIS
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Gérard BLOCH
CPI 92-1025

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Telephone: 33 (1) 53 04 53 04 Fax: 33 (1) 42 94 86 54

DESIGNATION OF THE INVENTOR(S) Page No. . 1 . / . 1 **INV**
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TITLE OF THE INVENTION (200 characters or spaces maximum)

Indirect shooting apparatus for fixing fastening elements in a base material

THE APPLICANT(S):

Société de Prospection et d'Invention Techniques SPIT

DESIGNATE(S) AS INVENTOR(S):

1 Name		ALMERAS
Forenames		Roland
Address	Street	15 rue du Général Chapelle
	Postcode and town	0 7 3 0 0 TOURNON - FRANCE
Employer company *(optional)*		
2 Name		HERELIER
Forenames		Patrick
Address	Street	7 rue du Vignau
	Postcode and town	0 7 3 0 0 SAINT JEAN DE MUZOLS - FRANCE
Employer company *(optional)*		
3 Name		VALLON
Forenames		Emmanuel
Address	Street	Les Abeilles - 16 rue Paul Vaillant-Couturier
	Postcode and town	2 6 8 0 0 PORTES DES VALENCE - FRANCE
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PARIS, 23 JANUARY 2004

Gérard BLOCH

(CPI 92-1025)

1st filing

The invention relates to an indirect shooting apparatus for fixing fastening elements in a base material.

With reference to Figure 1, an indirect-shooting fixing apparatus 1 allows a fastening element 2, for example a nail comprising a head 2′ and a stem 2′′, to be inserted into a base material. It is for example an explosive mixture which drives the fastening element 2, by means of a weight mounted movably in a barrel and an insert-guide 3, extending on an axis 9.

The nails 2 are loaded into the apparatus 1 in the form of a strip of nails 4. Each nail 2 is engaged, by its stem 2′′, in a sleeve 5, the sleeves 5 being connected together by shearable connecting means 6, in this instance called connector strips 6 that are diametrically opposed on each sleeve 5. The connector strips 6 are in this instance two in number on each side of a sleeve 5. Therefore, the nails 2 are placed, within the strip 4, parallel with one another, the sleeves 5 enclosing them being connected two-by-two by the connector strips 6.

In the rest of the description, the assembly formed by a nail 2 and a sleeve 5 will be designated a fastening assembly or assembly.

The strip 4 is placed in a loader 7, extending generally perpendicularly to the insert-guide 3. A return spring, placed at the end of the loader 7 opposite to the insert-guide 3, pushes the strip 4 toward the insert-guide 3. The fastening assembly (2, 5) opposite to the spring is therefore inserted into the insert-guide 3, its axis coinciding with the axis of the latter. At the time of shooting, its connector strips 6 are sheared, separating it from the adjacent assembly (2, 5), which is then pushed by the return spring toward the insert-guide 3.

The internal diameter of the insert-guide 3 is substantially equal to the largest external diameter, while masking the connector strips 6, of the sleeves 5, in order to ensure a correct guidance thereof up to its end, the connector strips 6, during the travel of a fastening assembly (2, 5), being squashed on the wall of the bore of the insert-guide 3.

The connector strips 6 protrude from the external surface of the sleeves 5. Therefore, in the wall of the bore of the insert-guide 3, a groove 8 is provided for housing connector strips 6, diametrically opposed to the loader 7. The connector strips 6 of the sleeve 5 inserted into the insert-guide 3 that are free are therefore housed in the groove 8, the loader 7 being arranged on the insert-guide 3 so that the connector strips 6 secured to the strip 4 are also placed outside the bore of the insert-guide 3. The diameter of the latter therefore perfectly matches the external diameter of the sleeves 5.

The loader 7 and its return spring impose on the strip 4 a movement of strict translation, ensuring the correct placement of the free connector strips of a sleeve 5 inserted into the insert-guide 3 in the groove 8, since it is secured to the strip 4. With reference to Figure 2, the last fastening assembly (2, 5) of the strip (4) is secured to no other assembly (2, 5). In Figure 2, the last assembly (2, 5) has been correctly inserted into the insert guide 3, its connector strips 6 opposite to the spring being housed in the groove 8. However, during its phase of insertion into the insert-guide 3, this assembly (2, 5) may be made to rotate about its axis by friction on a wall of the loader 7. The connector strips 6 are then no longer correctly positioned, the sleeve 5 having, with its protruding connector strips 6, a maximum external diameter greater than that of the bore of the insert-

guide 3. In order to compensate for this difference in diameter, under the stress of the return spring pushing it into the insert-guide 3, the fastening assembly (2, 5) is positioned on an axis that differs from the axis of the insert-guide 3, and is even not fully inserted into the insert-guide 3, causing a malfunction of the apparatus and an incorrect insertion of the nail 2 into its base.

The object of the present invention is to alleviate this drawback.

Accordingly, the invention relates to an indirect shooting apparatus for fixing fastening elements in a base material, comprising a weight, for driving a fastening element, mounted movably in a barrel and an insert-guide for guiding a fastening element toward the base material, the apparatus being arranged to receive a loader for receiving a strip of fastening elements in order to insert the fastening elements one by one into the insert-guide, each fastening element being held in a sleeve comprising shearable means for connection to another sleeve, said apparatus being characterized in that the insert-guide comprises a zone of enlarged section, preferably circular, at the mouth of the loader in the insert-guide.

Finally, the invention consists in daring to provide, if it may be said, a groove extending angularly over 360°.

In the preferred embodiment of the invention, the sleeves being connected together by connector strips, the zone of enlarged section has a diameter substantially equal to the diameter of the insert-guide increased by the radial dimension of a connector strip.

Preferably, the zone of enlarged section extends axially over the length of a sleeve increased by the travel of the insert-guide for the priming of the apparatus.

Advantageously, the zone of enlarged section is connected by a frustoconical portion to the rest of the bore of the insert-guide.

The invention will be better understood with the aid of the following description of the preferred embodiment of the apparatus of the invention, with reference to the appended drawing in which:

- Figure 1 represents a view in axial section of a fastening apparatus of the prior art;
- Figure 2 represents a view in section on the plane II-II of the apparatus of Figure 1;
- Figure 3 represents a view in axial section of the preferred embodiment of the fastening apparatus of the invention, with its insert-guide in the safety position, and
- Figure 4 represents a view in axial section of the preferred embodiment of the fastening apparatus of the invention, with its insert guide in the shooting position for the last fastening element.

With reference to Figure 3, the indirect shooting fastening apparatus 10 of the invention comprises a weight, not shown, mounted movably in translation in a barrel, not shown, and a cylindrical insert guide 11, of circular section with a diameter D, extending on an axis 12. A fastening element 13, loaded into the insert guide 11, can be driven into a base material by the weight under the effect of a propulsive mixture, its travel being guided by the insert-guide 11. The propulsion may be powder-based or gas-based for example.

The fastening elements 13 are in this instance nails, or inserts, made of metal, comprising a head 13′ and a stem 13′′ with a pointed end. The nails 13 are loaded into the apparatus 10 in the form of a strip 14 of nails 13. Each nail 13 is engaged and held, by its stem 13′′, in a plastic sleeve 15, of generally cylindrical shape and comprising a central cylindrical bore for receiving a stem 13′′ of a nail 13. The external shape of the sleeves 15 is not necessarily even, and may comprise recesses, flat portions, etc. Irrespective of this shape, which in this instance is not described because it is not necessary to the understanding of the invention, the sleeve 15 has a surface portion 17 of maximum diameter, usually generally cylindrical, the diameter of which corresponds, at least in part, to that of the head 13′ of the nail 13 that it receives. This diameter is created in order to be substantially equal to the diameter D of the bore of the insert-guide 11. This portion 17 is situated on the part of the sleeve opposite to the head 13′ of the nail 13 in order to guide, in cooperation with the head 13′ of the nail 13, the nail 13 on the surface 18 of the bore of the insert-guide 11.

The sleeves 15 are connected together by shearable connector strips 16 diametrically opposed on each sleeve 15. The connector strips 16 take the form of longitudinal rectilinear ribs protruding on the surface of the sleeves 15. In this instance they are two in number, aligned on each side of a sleeve 15, with a length representing, for each one, approximately a quarter of the length h of the sleeve 15. The nails 13 are therefore placed, within the strip 14, parallel with one another, the sleeves 15 holding them being connected two-by-two by the connector strips 16.

The fastening apparatus 10 of the invention is arranged to receive a loader 19 for receiving a strip 14 of

nails 13. This loader 19 is installed so as to extend perpendicularly to the axis 12 of the insert-guide 11, one of its ends leading into the insert-guide 11. The strip 14 is placed in the loader 19, the fastening assemblies (13, 15) extending parallel with one another and with the axis 12 of the insert-guide 11. A return spring, not shown, placed at the end of the loader 19 opposite to the insert-guide 11, pushes the strip 14 toward the insert-guide 11. The fastening assembly (13, 15) opposite to the spring is thereby inserted into the insert-guide 11.

For conventional reasons of safety, the insert-guide 11 of the fastening apparatus 10 must be pressed on the base material for shooting to be possible. In Figure 3, the apparatus 10 is in the safety position, its insert-guide 11 protruding from the casing 20 of the apparatus 10 for a length L. When the insert-guide 11 is pressed on the base material by the user, who applies a force in the direction of this base, the insert-guide 11 sinks into the casing 20 up to an abutment, a mechanism ensuring the priming of the apparatus in this position, in which it is therefore in the shooting position. In this position, shown in Figure 4, in this instance for the last fastening element 13, the insert-guide 11 protrudes from the casing 20 by only a length L', less than the length L. The length by which the insert-guide 11 is sunk in when the apparatus 10 is primed, that is to say the distance L-L', will be called the travel of the insert-guide 11 for the priming of the apparatus 10, or priming travel (L-L').

The bore of the insert-guide 11 comprises a zone 21 of enlarged circular section at the mouth of the loader 19 in the insert-guide 11. It function is to allow, before shooting, a free rotation of a sleeve 15 in the insert-guide 11, that is to say to allow the free rotation of the sleeve 15 despite the presence of the connector

strips 16 or portions of connector strips 16 which have remained secured to the sleeve 15 after shearing by the action of the weight.

In this instance, this function is mainly useful for the last fastening assembly (13, 15) of the strip 14. Specifically, as has been seen above, an assembly (13, 15), when it is secured to other assemblies (13, 15), remains in the axis of the strip 14. In this case, the zone 21 of enlarged section fulfils the same function as the groove 8 of the prior art.

The zone 21 of enlarged section has in this instance a diameter D' substantially equal to the diameter D of the insert-guide 11 increased by the radial dimension of two half-connector strips 16, that is to say of one connector strip 16. A half-connector strip extends from the portion of the connector strip 16 remaining secured to a sleeve 15 after shearing. Since the shearing of the connector strips 16 is not necessarily precise, the radial dimension of the portions of connector strips 16 remaining secured to a sleeve after shearing is uncertain, varying slightly around an average dimension equal to half the radial dimension of a connector strip. The diameter D' may take this uncertainty into consideration, because a slight clearance is not necessarily a fault.

Moreover, it may be that the last fastening assembly (13, 15) does not comprise connector strips 16 on its free side corresponding to the end of the strip 14. The diameter D' can then be substantially equal to the diameter D of the bore of the insert-guide 11 increased by the radial dimension of a half-connector strip 16.

Whatever the case, the diameter D' of the zone 21 of enlarged section is suited to the sleeves used and/or to the clearance that those skilled in the art intend

to tolerate; they will suit it to their desires and constraints.

In the embodiment of the invention described here, with reference to Figure 4, the sleeve 15 of the last assembly (13, 15) also comprises, on its free part, half-connector strips 16 which have no other use than to make of the last sleeve 15 a sleeve substantially identical to the others. Therefore, the diameter D' of the zone 21 of enlarged section is in this instance substantially equal to the diameter D of the bore of the insert-guide 11 increased by the radial dimension of a connector strip 16. Those skilled in the art will adapt this diameter D' more precisely to their requirements for clearance and manufacturing tolerances.

It goes without saying that the mouth of the loader 19 in the insert-guide 11 is designed to supplement the section of the zone 21 of enlarged section. In the latter, the rotation of the last fastening assembly (13, 15) is therefore not hampered.

The zone of enlarged section extends longitudinally for a distance H. The latter corresponds at least to the length h of a sleeve 15 increased, downstream in the direction of movement of shooting of the weight, when the insert-guide 11 is in the safety position, by the priming travel (L-L'). Therefore, when the apparatus 10 is primed, the insert-guide 11 rises with no change of section for the sleeve 15 that is in the insert-guide 11, in the shooting position. The connection with the portion of insert-guide 11 of diameter D, corresponding to the diameter of a sleeve 15 without the connector strips 16, is made in this instance by a frustoconical portion 22. The latter allows, when the fastening assembly (13, 15) is driven by the weight, a correct centering of this assembly (13, 15) when it passes from

the zone 21 of enlarged section to the zone with no enlarged section of diameter D, that is to say to the rest of the bore of the insert-guide 11. In the latter zone, the half-connector strips 16 are squashed against the surface 18 of the bore of the insert-guide 11.

The zone 21 of enlarged section extends in this instance longitudinally downstream, over the distance $H = h+(L-L')$, from the upstream end of a sleeve 15 when it is inserted in the insert-guide 11. Upstream, those skilled in the art may or may not choose to extend this zone of enlarged section or to adapt the section to the diameter of the weight.

The operation of the fastening apparatus 10 of the invention will now be explained in greater detail.

A strip 14 of fastening assemblies (13, 15) is received in the loader 19. The assembly (13, 15) opposite to the return spring is inserted into the insert-guide 11, which is in the safety position. This assembly (13, 15) is contained, with its connector strips 16, in the zone 21 of enlarged section of the insert-guide 11, with dimensions for this purpose. The insert-guide 11 is pressed against the base material by the user and sinks into the casing 20 up to its shooting position. The insert-guide 11 slides freely around the sleeve 15 of the assembly (13, 15) which is contained therein, because of the downstream extension of its zone 21 of enlarged section, for the length (L-L') of its priming travel, the downstream end of the sleeve 15 being able to press on its frustoconical portion 22 at the end of travel. The weight is driven by the explosive mixture at the time of shooting and drives the assembly (13, 15) into the insert-guide 11, the centering of this assembly (13, 15) being made easier by the frustoconical portion 22 for connection with the zone with no enlarged section of the insert-guide 11; the

connector strips 16 of the assembly (13, 15), secured to the strip 14, are sheared; they are then squashed, as are the connector strips 16 that are free, on the surface 18 of the bore of the insert-guide 11. The fastening element 13 is then inserted into the base material.

Because of the departure of the assembly (13, 15) from the insert-guide 11 and because of the force applied by the return spring, the next assembly (13, 15) is inserted into the insert-guide 11, when the latter has returned to its safety position and the weight has again risen to the shooting position. The apparatus 10 then operates likewise for each of the assemblies (13, 15) until the last. The latter, which is not secured to any one, may be made, when it is inserted into the insert-guide 11, to turn on its axis by friction on a wall of the loader 19, in particular. This rotation has no influence on the positioning of this last assembly (13, 15) in the insert-guide 11, since it is allowed by the zone 21 of enlarged section.

Claims

1. Indirect shooting apparatus for fixing fastening elements (13) in a base material, comprising a weight, for driving a fastening element (13), mounted movably in a barrel and an insert-guide (11) for guiding a fastening element (13) toward the base material, the apparatus being arranged to receive a loader (19) for receiving a strip (14) of fastening elements (13) in order to insert the fastening elements (13) one by one into the insert-guide (11), each fastening element (13) being held in a sleeve (15) comprising shearable means (16) for connection to another sleeve (15), said apparatus being characterized in that the insert-guide (11) comprises a zone of enlarged section (21) at the mouth of the loader (19) in the insert-guide (11).

2. Apparatus according to Claim 1, wherein the zone of enlarged section (21) is of circular section.

3. Apparatus according to Claim 2, wherein, the sleeves (15) being connected together by connector strips (16), the zone of enlarged section (21) has a diameter (D') substantially equal to the diameter (D) of the insert-guide (11) increased by the radial dimension of a connector strip (16).

4. Apparatus according to one of Claims 1 to 3, wherein the zone of enlarged section (21) extends axially over the length (h) of a sleeve (15) increased by the travel (L-L') of the insert-guide (11) for the priming of the apparatus.

5. Apparatus according to one of Claims 1 to 4, wherein the zone of enlarged section (21) is connected by a frustoconical portion (22) to the rest of the bore of the insert-guide (11).

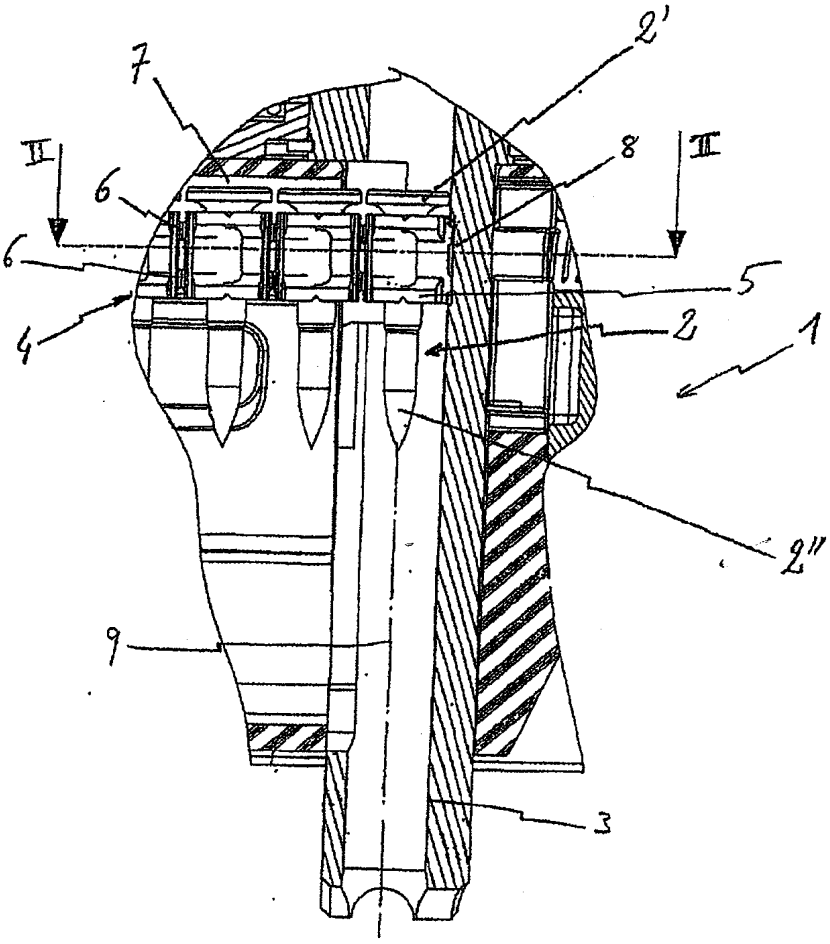

Figure 1

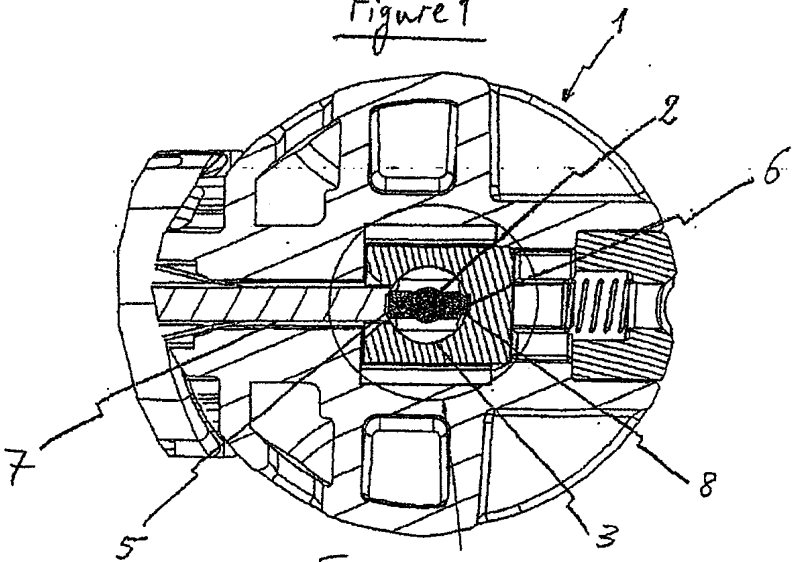

Figure 2

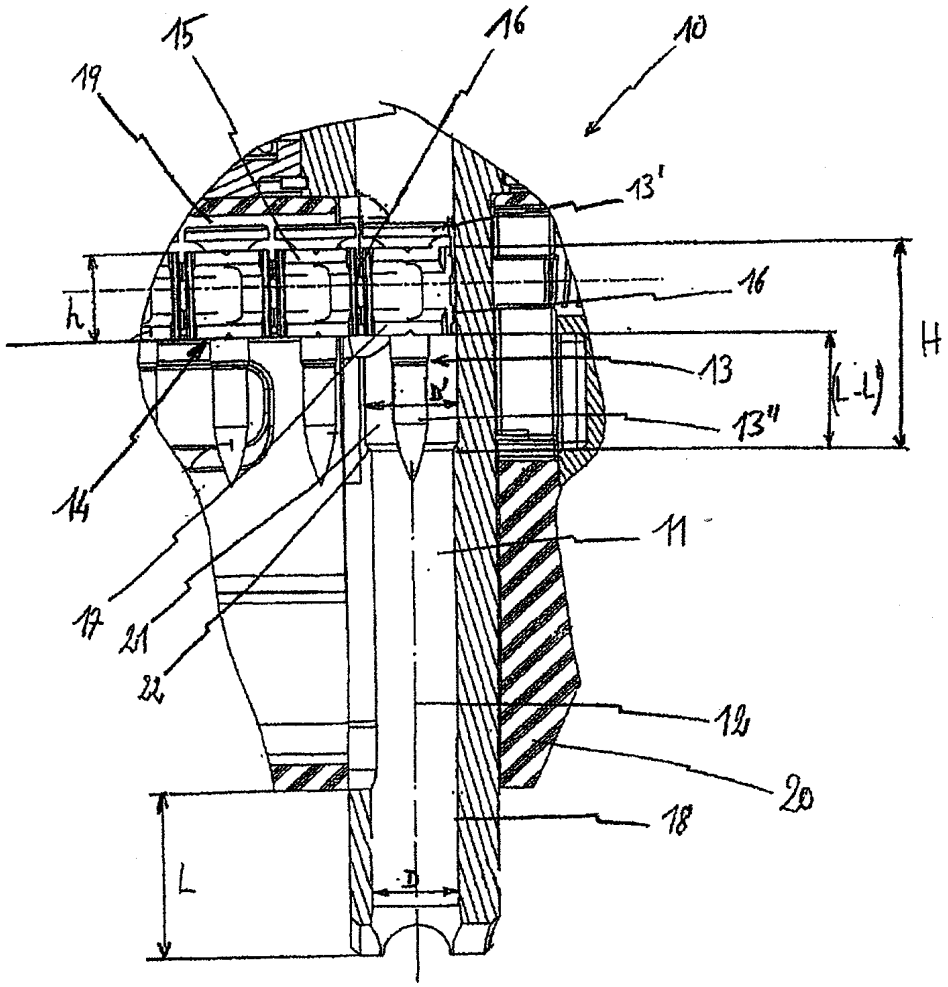

Figure 3.

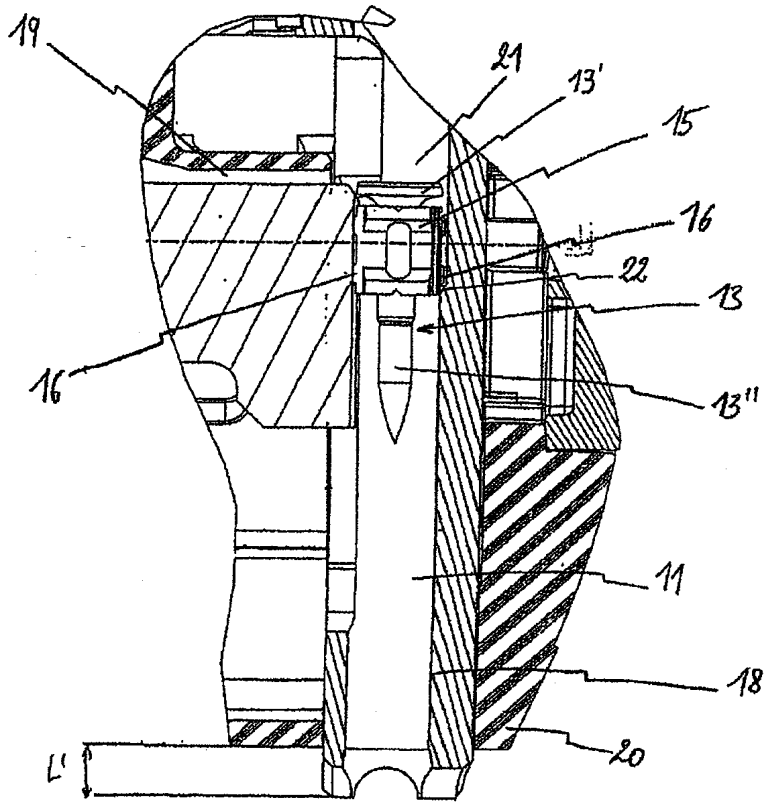

Figure 4

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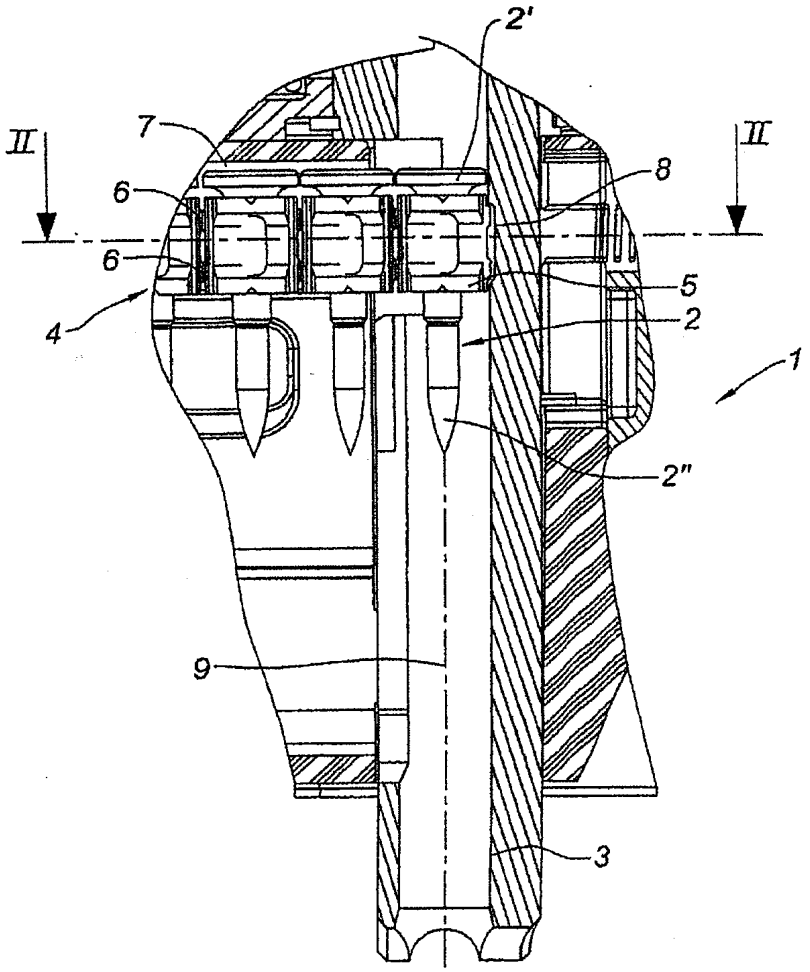

Fig. 1

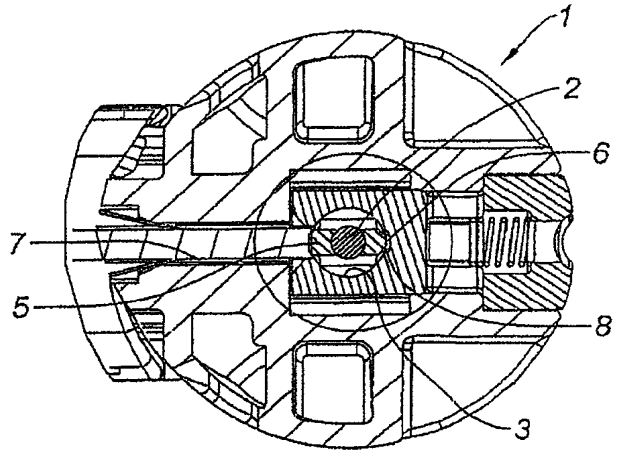

Fig. 2

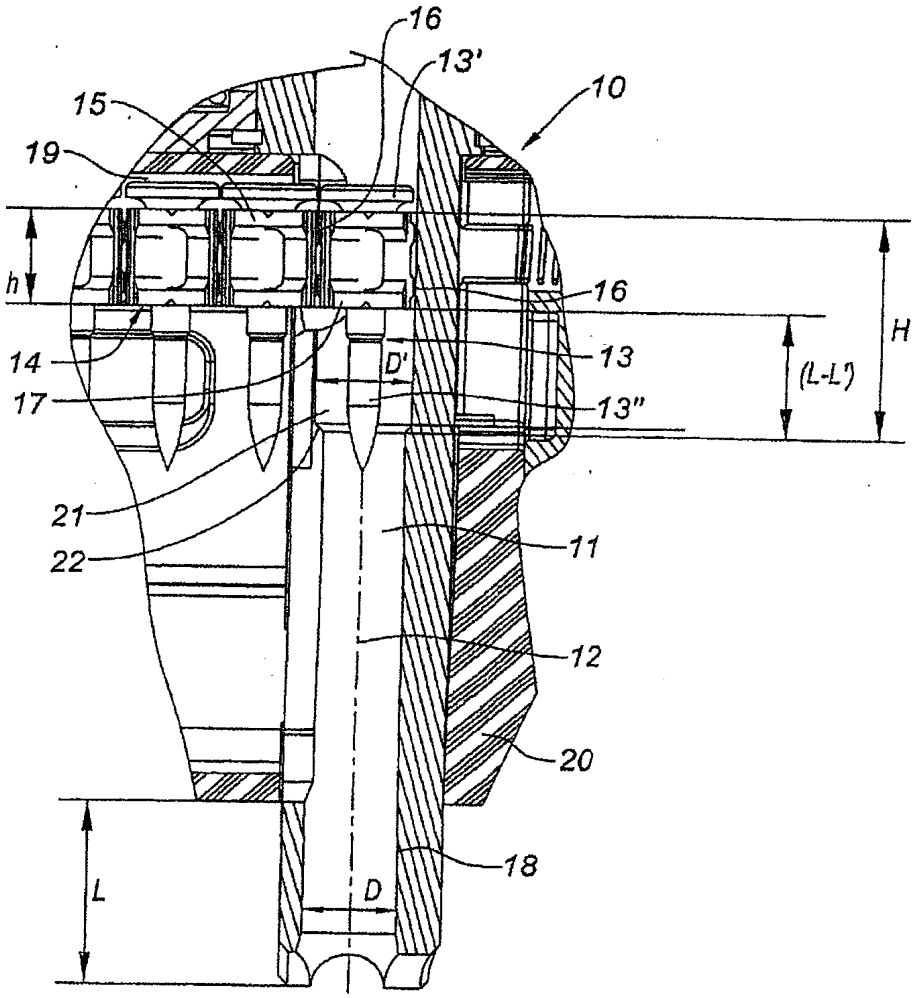

Fig. 3

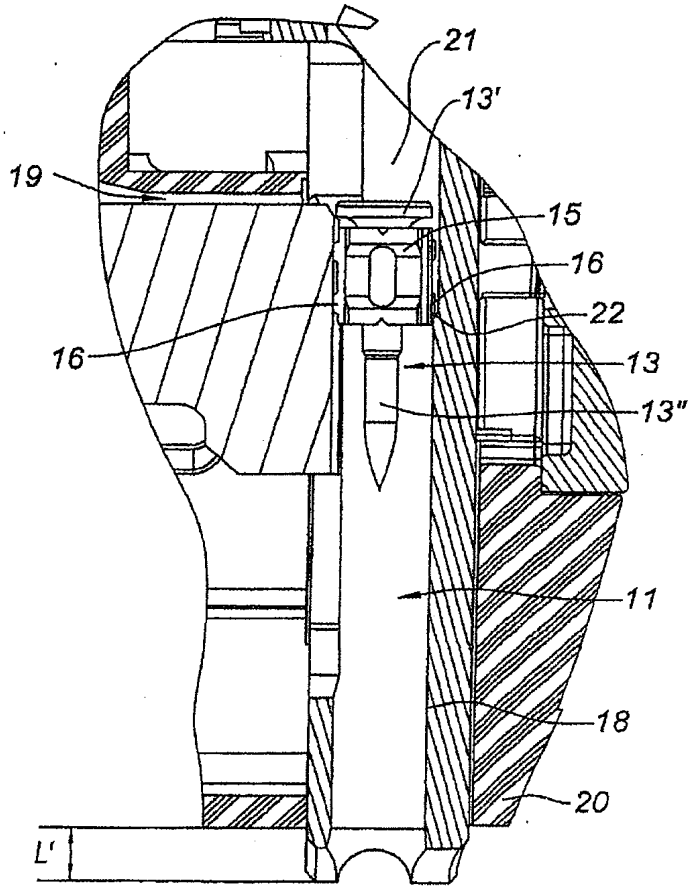

Fig. 4